SOME ASPECTS OF THE DYNAMICS OF VEGETATION IN THE PORT AUGUSTA-IRON KNOB AREA, SOUTH AUSTRALIA

by R. L. Cobbell* and R. T. Lange*

[Read 14 April 1966]

SUMMARY

The extremely slow rate of change in arid vegetation is demonstrated by means of photographs taken over a 23-year time period. A life span of 250 years for *Acacia sowdenii* is suggested by an indirect method.

At a conference held at the Mortlock Research Station, Yudnapinna, on 7th May, 1941, Mr. C. H. Goode, a member of the Pastoral Board, was commissioned to report on firewood cutting operations in the Port Augusta, Iron Knob, Iron Baron and Whyalla localities. On 8th July of the same year, Mr. Goode tabled his report – a comprehensive 33-page manuscript, including many small but detailed maps of the relevant paddocks, and illustrated by some 40 photographs. A file containing the report formed the basis for this investigation.

The area under consideration has a rainfall of 7·4 inches per annum, evenly spread over the year, but more dependable in winter. The average temperature is 64° F., with an average daily maximum in summer of 90° F. The vegetation of the area is largely *Acacia sowdenii* (myall) woodland, or a shrub steppe dominated by either *Kochia sedifolia* (bluebush) or *Atriplex vesicaria* (saltbush). It has been described by Murray (1931), Wood (1937), Crocker and Skewes (1941), and Jackson (1958), and will not be discussed in detail in this paper. The area has been grazed by sheep and the vegetation within three miles of the watering points is at a disclimax, e.g. where *K. sedifolia* has been overgrazed, it has been replaced by *K. erioclada* (black bluebush). The remainder of the vegetation, apart from the removal of some dead trees, approximates well to the virgin condition.

An examination of the photographs and location plans in the Goode report enabled the photopoints to be located approximately; in three cases the exact position was determined. Sometimes, however, difficulties were encountered because fences, roads, pipelines, tanks and even hills have been altered since the original photographs were taken. Where the areas were accurately located, photographs were taken from the same positions as used by Goode in 1941. (See Plates 1, 2 and 3.)

The opportunities for obtaining matched photographs showing details of the changes in the vegetation, particularly arid vegetation, over a long time period are very rare, a notable exception being the records kept of the Koonamore Vegetation Reserve. The photographs presented here enable the change, or lack of change, over a period of 23 years to be studied.

Perhaps the most striking feature of these comparisons is the extremely slow rate of change of the arid vegetation. In Plate 1, apart from some possible

* Department of Botany, University of Adelaide.

defoliation, which may only be temporary, there has been no apparent change in the trees. Plate 2 shows a myall that has lost only a few terminal twigs. The same is true of the dead myalls on the right and left of Plate 3, while the central dead myall, which had been reduced to a skeleton in the original photograph, had disappeared by 1964.

A similar slow change of arid vegetation was also noticeable in photographs taken at Koonamore Vegetation Reserve (Hall, Specht and Eardley, 1964). This in the living myalls invites questions as to the age of these trees, especially as some have a circumference of over two and a half metres at 10-centimetre height. In the absence of any estimate of their life-span, an argument arriving at a provisional age may be developed along the following lines. The myalls, unlike the mulgas (*Acacia aneura*), are not in contemporaneous stands, but apparently grow more or less asynchronously. This is reflected by the trunk circumference-frequency data presented in Fig. 1, which is consistent with the view that all

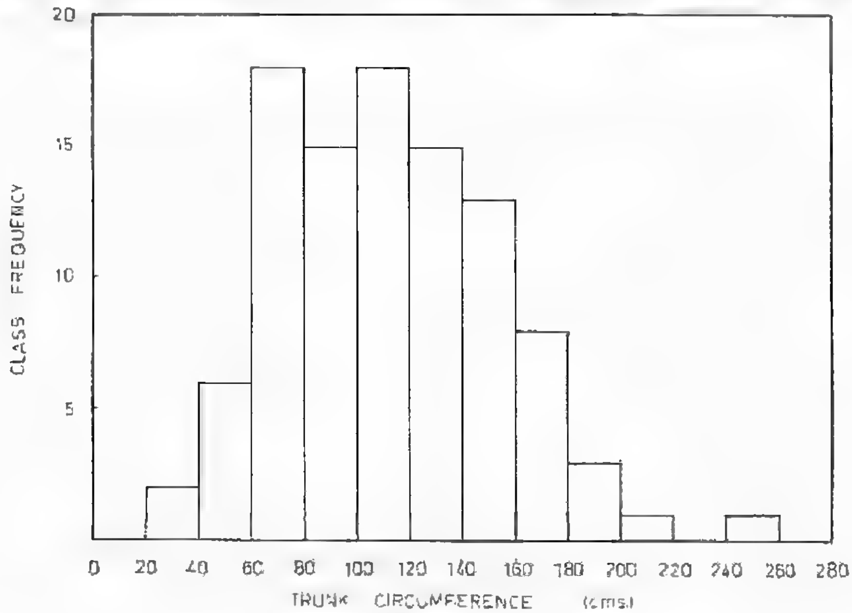

Fig. 1.

the trees can be regarded as independently proceeding from germination as seedlings to mature trees, followed by death and disintegration. Assuming a steady state, the ratio of live to dead trees would then be the same as the ratio of the time it takes for a seedling to develop into a mature tree and die, as compared to the time it would take a dead tree to disintegrate. This is the same rationale as was used by Howard and Pelc (1952) in cytology.

The ratio of live to dead trees was calculated by a modification of the point-centre quarter method (Cottam and Curtis, 1956). Fifty points were located over a distance of 20 miles by restricted randomization in the myall woodland community near Hesso Railway Station. Particular care was taken to avoid areas that had been used for firewood cutting operations or showed any sign of recent fire. The scores for the different points were classified on the basis of the number of live trees in the sample (see Table 1). To test the data for homogeneity, it was compared to the expected binomial by means of a Chi-squared test. As the deviation was not significant, the data were considered as being consistent with a ratio of live to dead trees of 0·72 : 0·28. This ratio is suggested as equivalent to the ratio of the length of the time periods required for the growth and disintegration of a myall tree.

From the photographs presented here, 50 years would be a conservative estimate of the disintegration time of a newly-dead myall; a 100 years would be a more realistic figure. (This estimate is given support by an examination

TABLE 1.

Number of live trees	Frequency observed	Frequency expected
0	1 } 14	·31 } 15·66
1	2 }	3·16 }
2	11 }	12·19 }
3	24	20·90
4	12	13·44
Total	50	50·00

$\chi^2 = 0{\cdot}78$ (probability 0·30-0·50).

of the photographs of Quadrat 100, at the Koonamore Vegetation Reserve (Hall, Specht and Eardley, 1964).) As the sandalwood trees (*Myoporum platycarpum*) that died between 1931 and 1936 were still standing in 1962, their disintegration time must be longer than 30 years. Based on the conservative estimate, a life-span of a myall would be:

$$\frac{.72}{.28} \times 50 = 130 \text{ years.}$$

Based on the 100 year disintegration period, the life span of a myall would be over 250 years.

As stated above, this estimate is only provisional. It does show, however, that myall trees can be very old – possibly old enough to be measured by carbon dating.

ACKNOWLEDGMENTS

The authors wish to acknowledge the co-operation of the Pastoral Board during this investigation. Professor R. N. Robertson read the manuscript and offered some valuable suggestions.

REFERENCES

Cottam, C., and Curtis, J. T., 1956. The Use of Distance Measures in Phytosociological Sampling. Ecology, 37, pp. 451-460.

Crocker, R. L., and Skewes, H. R., 1941. The Principal Soil and Vegetation Relationships on Yudnapinna Station, North-west South Australia. Trans. Roy. Soc. S. Aust., 65, pp. 44-60.

Hall, E. A. A., Specht, R. L., and Eardley, C. M., 1964. Regeneration of the Vegetation on Koonamore Vegetation Reserve, 1926-62. Aust. J. Bot., 12, pp. 205-264.

Howard, A., and Pelc, S. R., 1952. Synthesis of Desoxyribonucleic Acid in Normal and Irradiated Cells and its Relation to Chromosome Breakage. Heredity, 8 (Suppl.), pp. 261-273.

Jackson, E. A., 1958. A Study of the Soils and Some Aspects of the Hydrology at Yudnapinna. C.S.I.R.O., Aust. Div. of Soils, Soils and Land Use., Ser. 24.

Murray, B. J., 1931. A Study of the Vegetation of the Lake Torrens Plateau, South Australia. Trans. Roy. Soc. S. Aust., 55, pp. 91-112.

Wood, J. G., 1937. The Vegetation of South Australia. Government Printer, Adelaide.

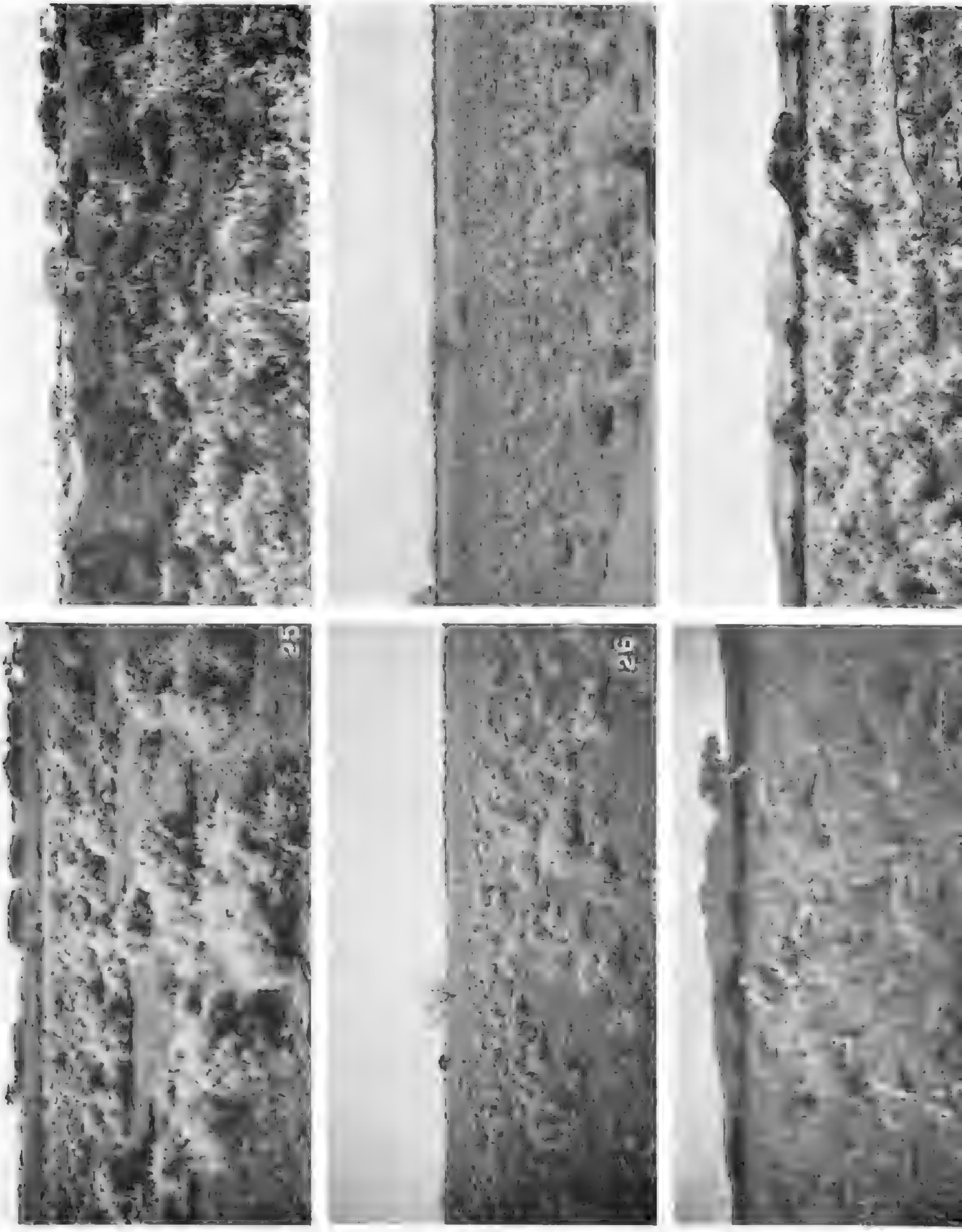

Fig. 1. (Corresponding to 25 in the report.) Looking east toward the entrance fluming of East Bannon's Dam.

Fig. 2. (Corresponding to 26 in the report.) Taken from the south bank of East Bannon's Dam.

Fig. 3. (Corresponding to 35 in the report.) Taken from the southern boundary of Corunna Station, looking west towards Iron Knob.